

Western Asia Bat Research Network



Bat One Health Research Network (BOHRN) Biological Threat Characterization Discussion

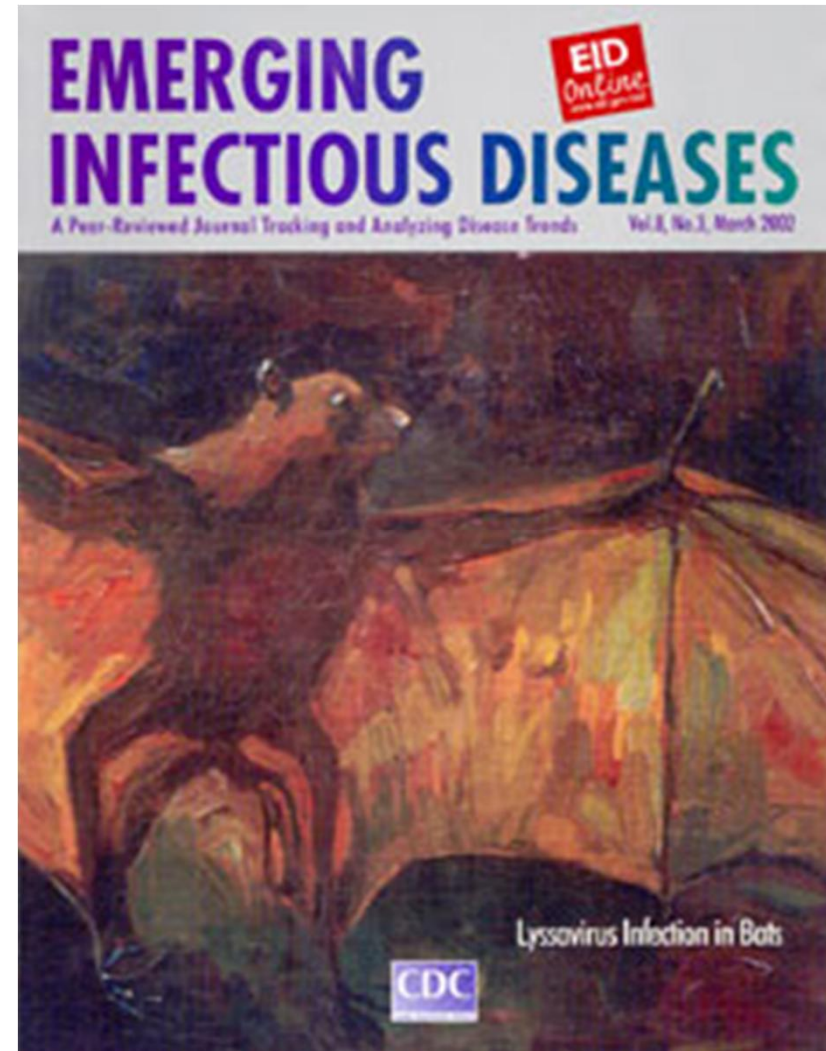
*Biosurveillance Network of the Silk Road
25 September 2018*

Western Asia Bat Research Network



Emerging Diseases from Bats

- Notable bat-borne viruses: Ebola, Marburg, Nipah, Hendra, SARS-CoV
- Bats harbor a greater proportion of zoonoses than other mammalian orders (Olival et al. 2017, *Nature*)



Importance of understanding potential routes transmission for human exposure



Blood,
saliva,
feces,
Urine.



Defining Western Asia



Origins of the Western Asia Bat Research Network (WAB-Net)

- EcoHealth Alliance's experience with other Research Coordination Networks (EcoHealthNet 2012- and SEABCRU 2007-)
- MERS-CoV surveillance in KSA (2012-13)
- Singapore bat training May 2014
- Early discussions with DTRA about supporting Western Asia/Middle East bat research and capacity building efforts (2015)
- Side meeting at Int'l Bat Research Conf (2016)
- Grant funded by DTRA-CBEP, project launched Sept 2017

DTRA WAB-Net Project Primary Objectives (2018-22)



- i. Characterize bat coronaviruses across Western Asia, and test hypotheses that:**
 - i. CoV diversity correlates with host species diversity in a given geographic area.
 - ii. Ecological and host species traits predict CoV diversity.
 - iii. Bats and their CoVs have co-evolved
- ii. Analyze and map bat pathogen spillover risk** by including broader, regional ecological data
- iii. Strengthen regional scientific capacity and collaboration through the Western Asia Bat Research Network (WAB-Net)**
 - i. Annual workshop; field training events associated w CoV study; research exchanges from field-to-lab

Assessing priorities and gaps in bat research from the Middle East/Western Asia

International Bat Research Conference

Durban, South Africa, 3 August 2016



1st Annual Western Asia Bat Research Network (WAB-Net) Workshop, 17-19 Sept 2018

Tbilisi, Georgia



1st Annual WAB-Net Workshop

Participants by country

<u>Country</u>	<u># Attending</u>	<u># Invited</u>
Armenia	1	3
Azerbaijan	1	1
Georgia	8	8
Iran/Germany	1	1
Iraq	0*	4
Israel	0	1
Jordan	3	5
Kazakhstan	3	3
Lebanon	1	1
Oman	1	2
Pakistan	1*	7
Saudi Arabia	1*	2
Singapore	1	1
Turkey	3	5
United Kingdom	2	2
USA	12	16
TOTAL	37	62



* Some participants were unable to attend due to visa issues

WAB-Net Workshop Topic Areas

- One Health Model: Linking Bat EID Surveillance and Ecology
- WAB-Net and the Threat Reduction Network model and links to global health security
- Bat Diversity and Practical Taxonomy for Western Asia
- Bat Ecology and Understanding Viral Ecology



WAB-Net Workshop Topic Areas, continued

- Field methods for joint disease and ecology investigations
- Sample processing and testing methods
- Biosafety, Biosecurity & PPE ‘Olympics’
- Linking WAB-Net to BOHRN



WAB-Net Bat Coronavirus Surveillance and Field Training, Georgia, Sept 2018



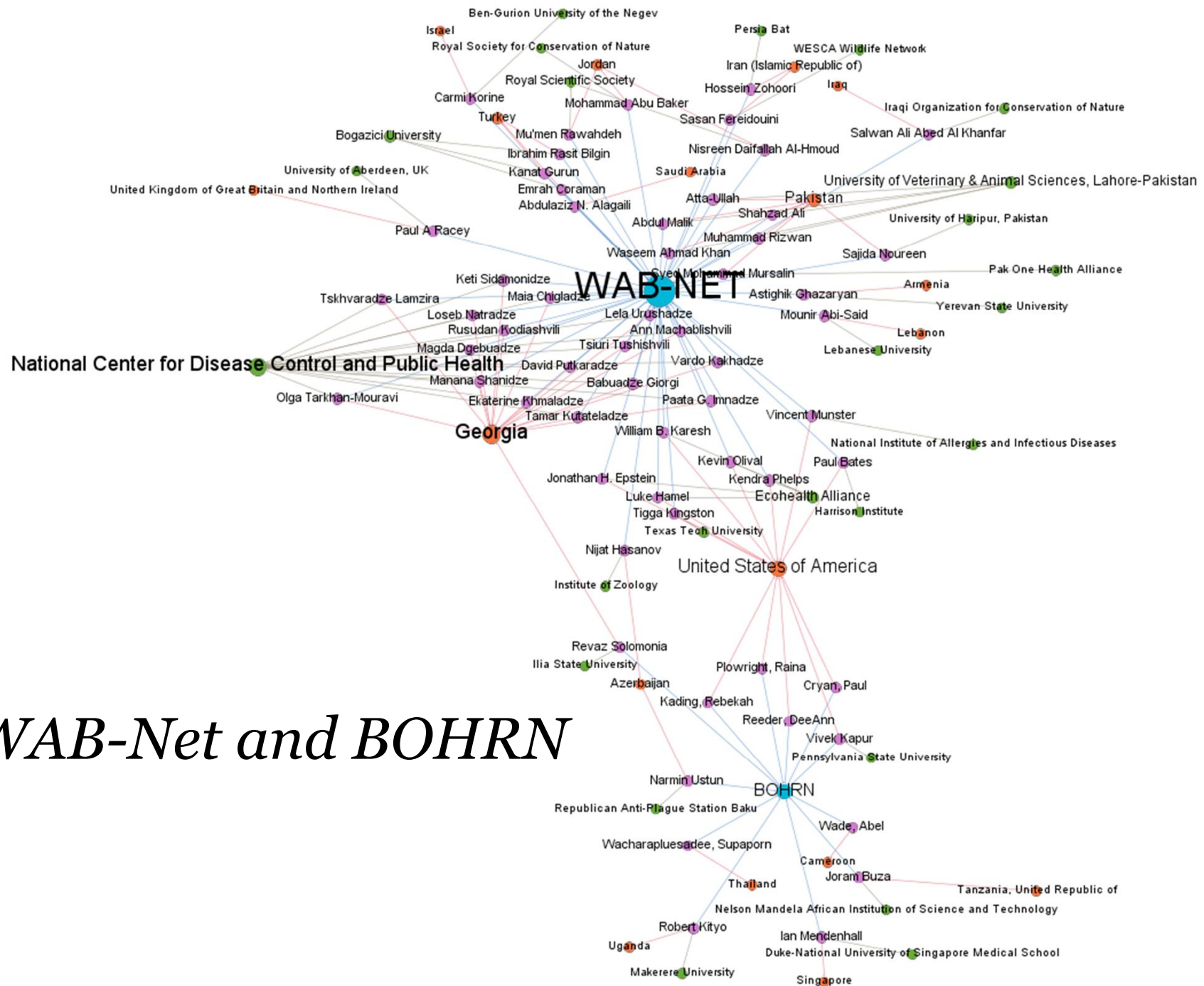
WAB-Net Coronavirus and Risk Characterization

- i. R. Lugar Center will serve as one of two regional laboratory hubs for the network.
 - i. Characterize and sequence diverse bat-CoVs
 - ii. Serve as training mentors for 2-3 week long field-to-lab fellows from other countries in the region
- ii. Data from viral sequences and greater ecological data on bat species and environment will be used to improve bat-human spillover risk models for threat reduction

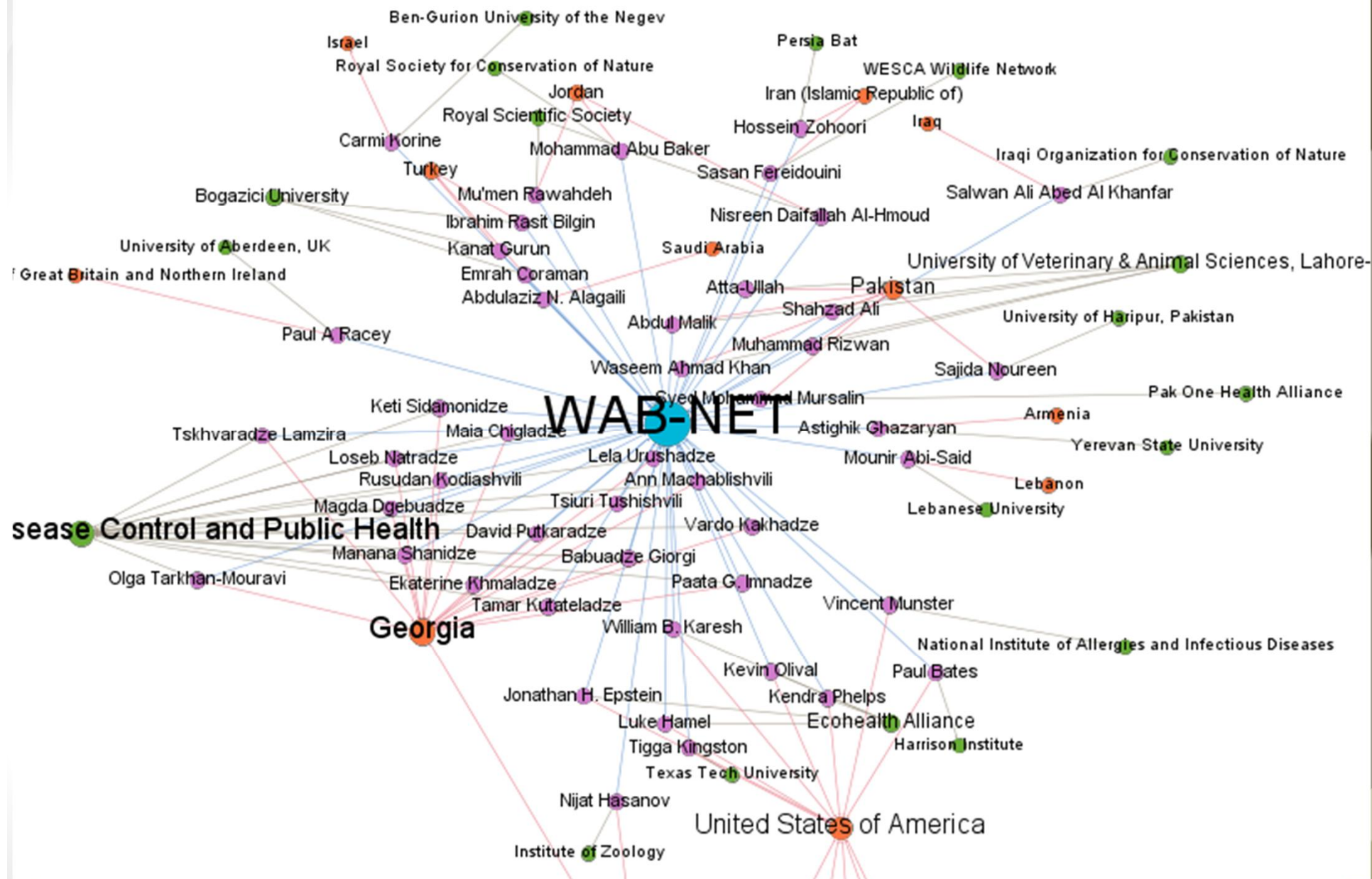
Sci-Net

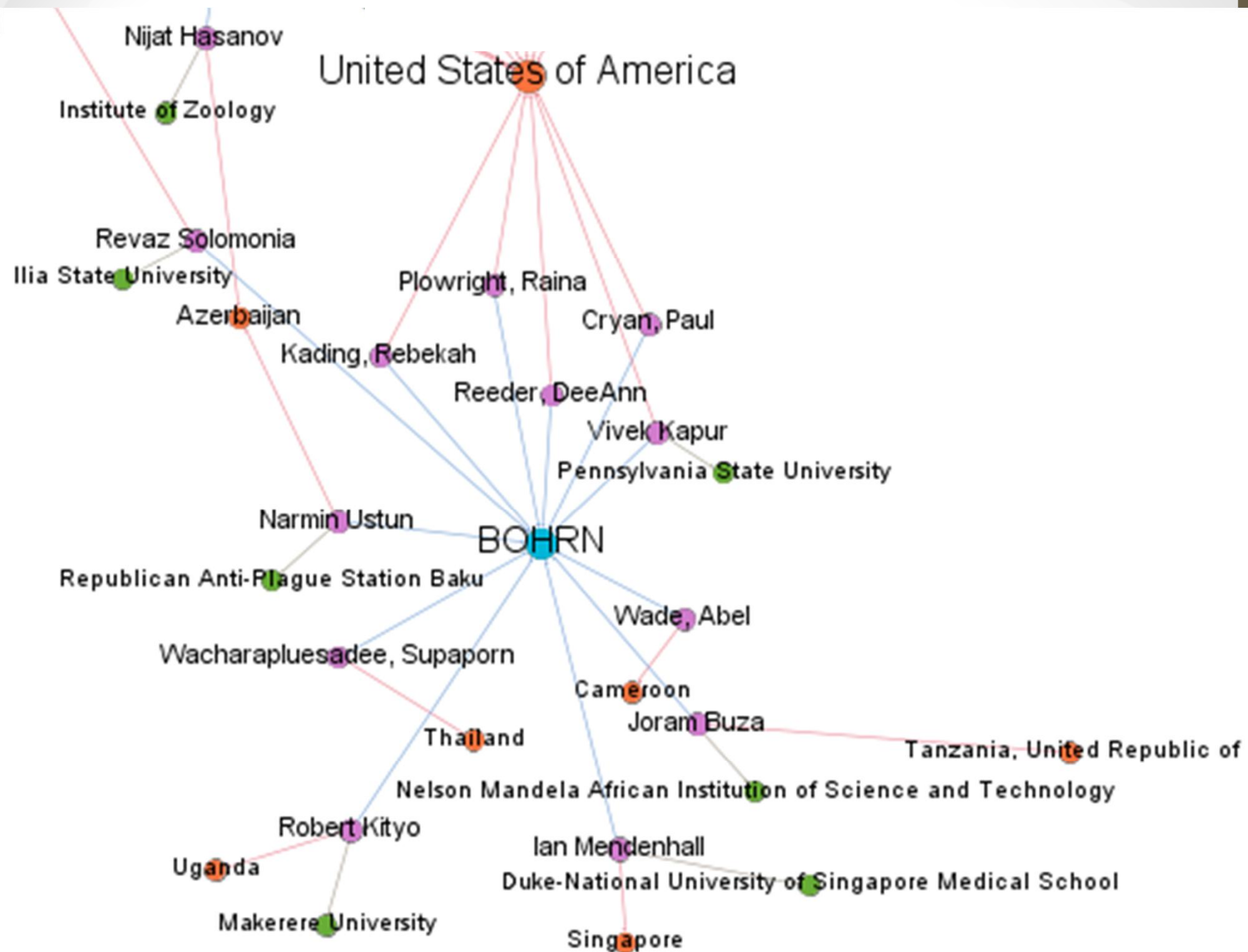
The Dynamics of
Threat Reduction Networks of
The Biological
Threat Reduction Program





WAB-Net and BOHRN



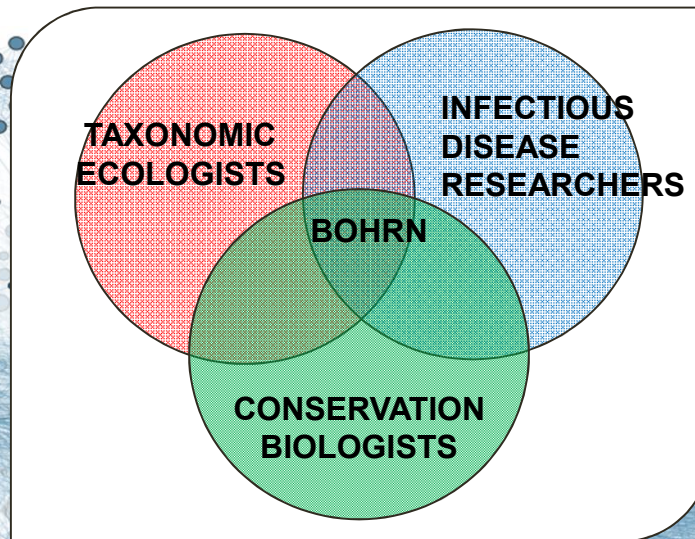


Bat One Health Research Network
(BOHRN) Biological Threat
Characterization Discussion

How BOHRN was born

- Directed to address the spillover threats
- Initiated and convened regional efforts into a global consortium of networks
- Starting in 2014, BTRP established threat reduction networks for high-risk, priority pathogen research
 - Biosurveillance and Transformative Science (BATS!) in Singapore
 - WAB-Net
 - BOHRN
 - Melioidosis in SEA
 - Rickettsias world-wide
 - African Swine Fever

Vision



Convene a multidisciplinary consortium of disease researchers, conservationists, policy makers, and medical/veterinary practitioners into a network to characterize global threats of bat-borne pathogens and formalize community standards and conservation-conscious practices for One Health disease research.

BOHRN Steering Committee Participants

- EcoHealth Alliance
- Penn State University (U.S.)
- Royal Scientific Society (Jordan)
- Research Institute for Tropical Medicine (Philippines)
- U.S. Geological Survey (U.S.)
- Colorado State University (U.S.)
- Texas Tech University (U.S.)
- Makerere University (Uganda)
- NCDC (Georgia)
- Bucknell University (U.S.)
- WHO CC for Research and Training in Viral Zoonoses (Thailand)
- Duke NUS Medical School (Singapore)
- National Veterinary Laboratory (Cameroon)

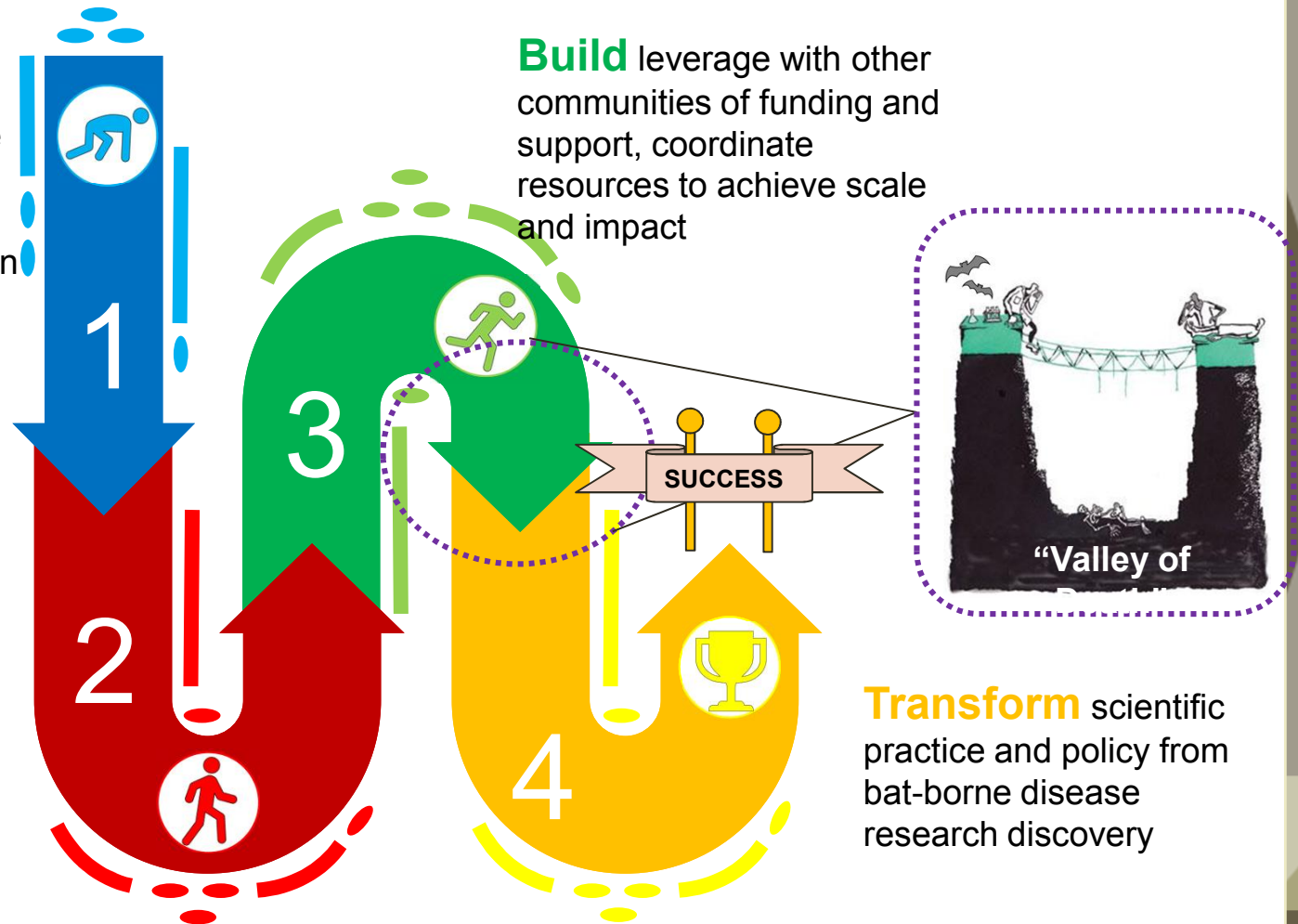
BOHRN Strategy Map

Establish a bat-borne pathogen network that operates at the BTRP to support the BTRP mission

Collaborate with country partners and stakeholders to promote interdisciplinary science, and create synergies

Build leverage with other communities of funding and support, coordinate resources to achieve scale and impact

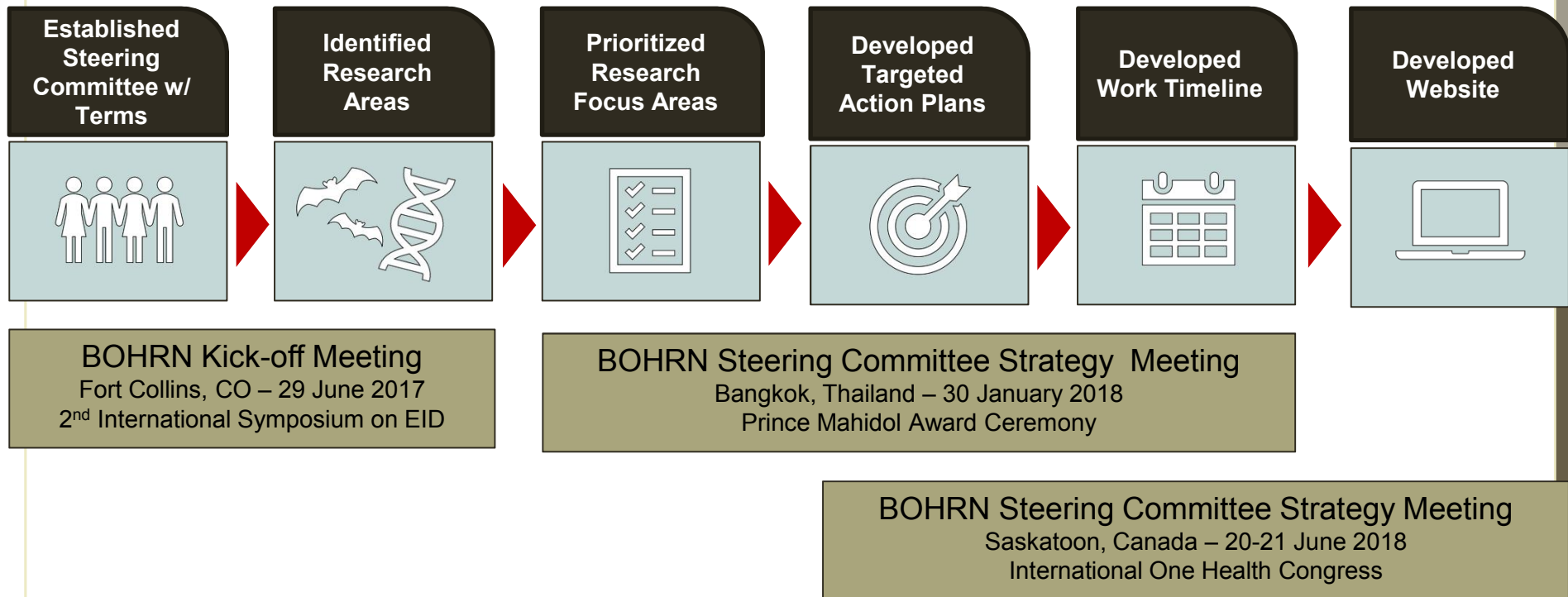
Transform scientific practice and policy from bat-borne disease research discovery



BOHRN Network Objectives

- Facilitate interdisciplinary collaboration to identify research goals and needs for bat-borne disease research and broader threat reduction
- Create a common action plan that yields collaborative and sustainable projects, which:
 - Better inform policy makers;
 - Better inform the scientific community regarding funding targets and gaps in areas of research and development;
 - Better define the threat of bat-associated pathogens to global health security
 - Improve national, regional, and global capacity to detect and respond to pathogens of security concern
- Enable better communication, coordination, and outreach at the research and conservation interface

BOHRN Progress



GROUP 1

Group 1 is working on projects that study host / pathogen biological interactions



Bat physiology and immunology

Not enough is known about bat immune response to pathogens; perhaps bats' daily flight-induced increase of body temperature may explain why they are able to co-exist with pathogens without clinical signs.¹

Bat pathogen community biology

Very few studies have involved hypothesis testing regarding pathogen associations (e.g., co-infections, co-morbidities, and the bat microbiome).²

Distribution of pathogens amongst species

Bats belong to the second most species-rich order of mammal with more than 1100 species, but only a few species have been identified as natural or suspected reservoirs of pathogens of security concern.³

GROUP PRIORITIES:

- Identify new technologies that are species independent, which could provide insight into interactions between bats and viruses
- Address how pathogen ecology drives infection dynamics in bats
- Address the role of host-ecological dynamics in driving bat infection

¹ <https://blogs.scientificamerican.com/guest-blog/why-don-t-bats-get-ebola/>

² [Zoonoses Public Health](#). 2013 Feb; 60(1): 2–21.
doi: [10.1111/zph.12000](#)

³ [Viruses](#). 2014 Dec; 6(12): 4880–4901.

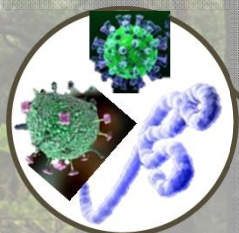
Published online 2014 Dec 8. doi: [10.3390/v6124880](#)

WORKING GROUP RESEARCH MENTORS:

Dr. Deeann Reeder, *Bucknell University* | Dr. Vivek Kapur, *Penn State University* | Dr. Joram Buza, *The Nelson Mandela Institute of Science and Technology*

GROUP 2

Group 2 is working on projects that study pathogen surveillance, diagnostic capacity, and epidemiology



Detection, diagnosis, and reporting of bat-associated pathogens

It is important to understand distribution of bats, diversity of their pathogens, and potential for zoonotic disease emergence.

Molecular epidemiology

Not enough is known about the genetic diversity of pathogens within bat species. Certain advanced molecular and diagnostic methods could be interlinked with flexible statistical methods and experimental studies.¹

GROUP PRIORITIES:

- Better understand viral shedding and transmission of pathogens in bats
- Better understand the epidemiological links between bats, pathogens, and other hosts
- Conduct field research: sampling, screening, and characterizing viruses of bats

Geographic and phylogenetic distribution of pathogens

An important question is what determines the range of pathogens found in bats and geographic variability of the community of pathogens within bat species.

¹ [Viruses](#) 2014 Apr; 6(4): 1759–1788.
Published online 2014 Apr
17. doi: [10.3390/v6041759](#)

WORKING GROUP RESEARCH MENTORS:

Dr. Abel Wade, *LANAVET* | Dr. Jon Epstein, *EcoHealth Alliance* | Dr. Catalino Demetria, *RITM* | Dr. Lela Urushadze, *NCDC Georgia* | Dr. Supaporn Wacharapluesadee, *Bangkok University* | Dr. Tamar Kutateladze, *NCDC Georgia*

GROUP 3

Group 3 is working on projects that research ecology (bat, domesticated animal, and wildlife interface)



Bat behavior, distribution, and movement

Relatively little information is available about bat behavior and ecology during migration, which is in part due to limitations of current technology to track small animals.

Anthropogenic disturbance and modification

Human impact on the environment (anthropogenic disturbances) such as livestock grazing, forest clearing, and the introduction of invasive species.

Domesticated animals and wildlife behavior, distribution, and movement impact on interaction with bats

The challenge of understanding the changing dynamics of domestic and wild animal populations, and how those changes impact bat populations and disease exposure.

GROUP PRIORITIES:

- Explore new and existing tracking technology commonly used for wild bird populations
- Understand full scope of changing landscapes, deforestation, encroachment, and other activities that create opportunities for disease interactions with bats
- Communicate a public health and conservation perspective; to prevent vilification of bats



WORKING GROUP RESEARCH MENTORS:

Dr. Paul Cryan, *USGS Fort Collins Science Center* | Dr. Tigga Kingston, *Texas Tech University* | Dr. Robert Kityo, *Makerere University*

Hunting and commodity chain

Harvesting, consumption, and trade of bushmeat, guano, and pets are important causes of biodiversity loss and potential disease emergence; there is a need to understand the scale of hunting and the full scope of the global commodity chain as it relates to bat-associated pathogens.



Interactions in human dwellings

Better communication strategies are needed for areas where human-bat interactions are common, since they most frequently occur with sick or injured bats.



Ecotourism

Worldwide, bat roosts are becoming an increasingly popular attraction for ecotourists; educating these populations can encourage roost site protection, education, and awareness about bats.

GROUP 4

Group 3 is working on projects that research human – bat interactions, risk characterization

GROUP PRIORITIES:

- Understand the full scope of human interactions with bats
- Characterize risk of human-bat interaction

WORKING GROUP RESEARCH MENTORS:

Dr. Kevin Olival, *EcoHealth Alliance* | Dr. Ian Mendenhall, *Duke / NUS*

BOHRN Next Steps

- 1st Annual BOHRN Meeting, 8-9 November 2018 in Vienna, Austria
 - Concurrent with International Meeting on Emerging Diseases and Surveillance
 - Objectives – (1) convene focus area groups for discussions on global priorities and potential projects, with additional participation from relevant experts; (2) identify available funding programs, their interests, and their funding timelines
- 2nd Biological Threat Characterization Discussion, TBD Feb/Mar 2019 in Muramagambo Forest, Uganda
- BOHRN Steering Committee Side-Meeting, TBD July 2019 in Phuket, Thailand
- 3rd Biological Threat Characterization Discussion, Feb / Mar 2020 in SEA